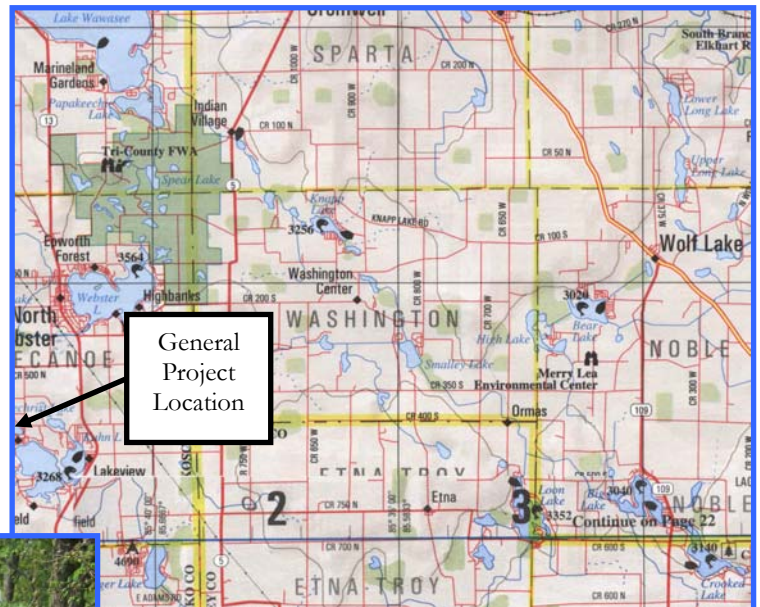


# WEBSTER LAKE - CULVER PROPERTY STORM WATER FILTRATION Report

North Webster,  
Kosciusko County, Indiana  
March 27, 2007



Prepared for:

**Webster Lake Conservation  
Association**

North Webster, Indiana



Prepared by:



708 Roosevelt Road  
Walkerton, Indiana 46574



# WEBSTER LAKE - CULVER PROPERTY STORM WATER FILTRATION PROJECT KOSCIUSKO COUNTY, INDIANA

## 1.0 PROJECT DESCRIPTION AND PURPOSE

The Webster Lake–Culver Property Storm Water Project is located in the watershed flowing into the northwestern corner of Webster Lake, in North Webster, Indiana (Figure 1). The project is specifically located on the approximate 30 acre parcel at the northwest corner of Epworth Forest Road and Hoss Hill Road, ½ mile east of State Road 13 (Figure 2). The property is owned by Bart Culver. The property was predominantly in agriculture, with a few acres of woods, wetland, and about ½ acre of grass covered land adjacent to Epworth Forest Road. The agricultural use included a rotation of soybeans and corn utilizing standard tillage practices. An artificial channel of Webster Lake and adjacent to Center Street is the recipient of storm water runoff from approximately 80 acres including the Culver property and extending into the Tri-lakes Fish and Wildlife Area on the east side of Hoss Hill Road (Figure 3).

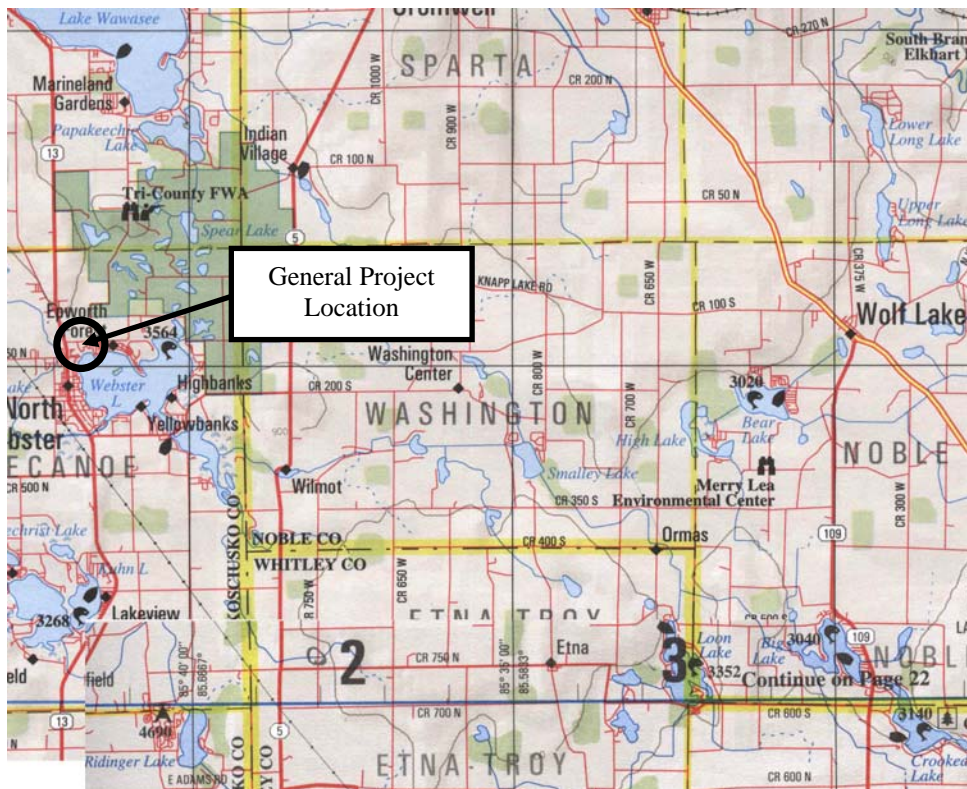
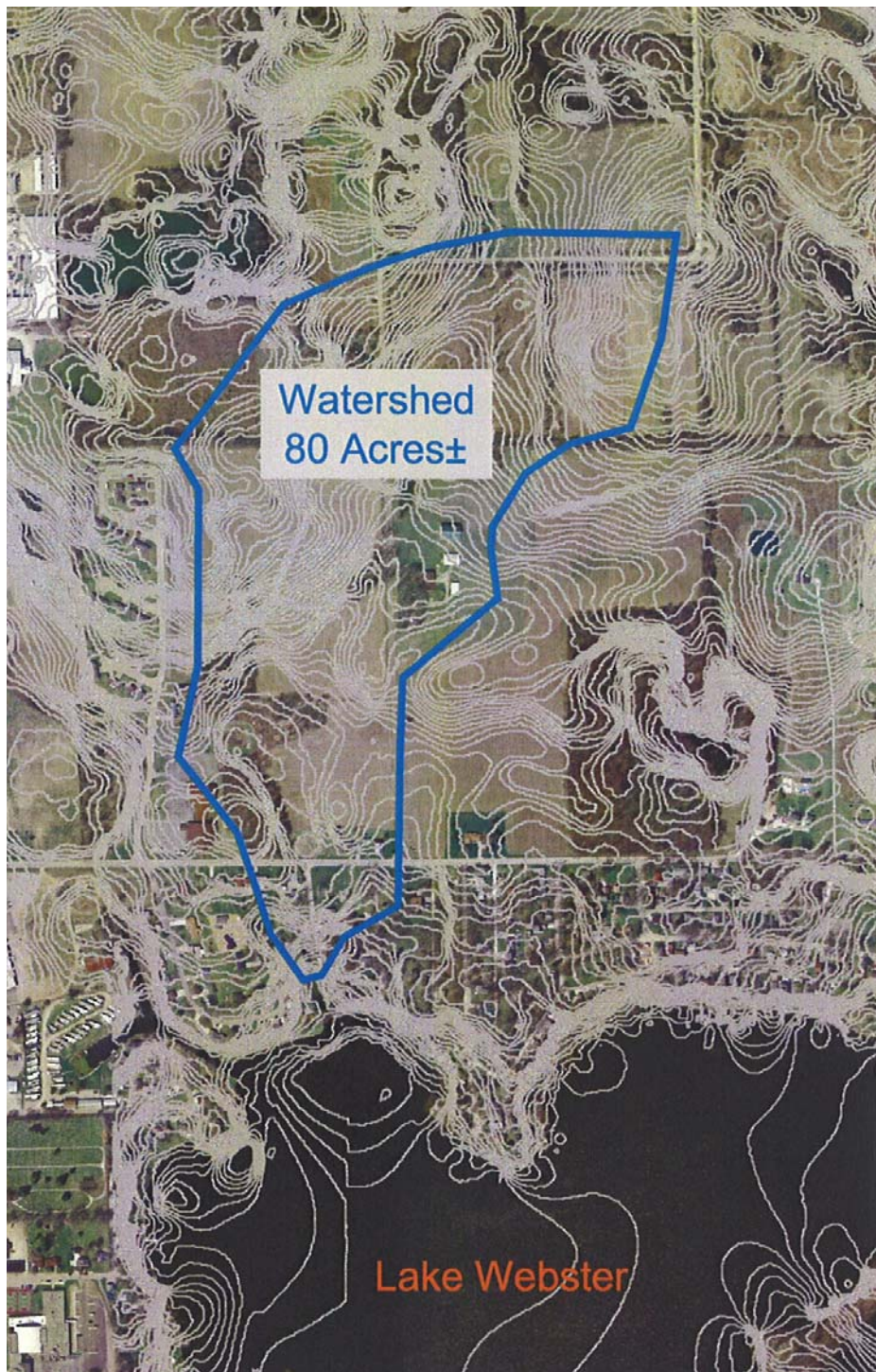


Figure 1. Webster Lake - Culver Property general project location.







**Figure 3: Hoss Hill Road sub-watershed of Webster Lake**



## **2.0 DESIGN RATIONALE**

The project purpose was to reduce the in-lake loading of sediment from this 80-acre subwatershed of Webster Lake. To accomplish this reduction in sediment loading we chose to directly address the primary source of sediment, which was an approximate 30-acre agricultural field with moderate to severe slopes and highly erodible soils. The tenant farmer had been rotating between corn and soybean crops on the field using conventional tillage practices every other year. We first sought to convert the agricultural field to a hay crop or no-till methodology with the current tenant farmer. When that failed, we worked with the landowner and eventually, the Tippecanoe Environmental Lake and Watershed Foundation (TELWF) to find a new tenant that would utilize the ground for a hay crop.

Taking the land out of conventional tillage was the first step. The second step involved installing grassed waterways in the primary path of storm water runoff in the same field. At the end of the grassed waterways, which were not tiled, a stormwater retention basin was designed to hold and filter the majority of sediments that might be carried through the field. Downstream of the field, the drainage passed under Epworth Forest Road and then was intermittently tiled and surface exposed through several residential yards before exiting through a culvert under Center Street – West into a channel off Webster Lake. Sediment, lawn waste, and presumably lawn fertilizer, had been a constant source of contamination to the lake for many years from this reach. The design included repairing broken sections of tiles to eliminate the contamination from the yards.

## **3.0 DESIGN AND CONSTRUCTION SPECIFICS**

### **3.1 Permitting**

No Federal or State permits were required for this project as it involved no existing definable waterway except for the repair and replacement of existing drainage tile.

### **3.2 Landowner Agreements**

A landowner agreement was obtained from Bart Culver for the work on the agricultural field. The agreement is attached in Appendix A.

### **3.3 Grassed Waterways**

Design plans are contained in Appendix B. Design calculations are contained in Appendix C.

The upper grassed waterway was constructed approximately 400 feet long and 20 feet wide. Prior to grading, two vertical trenches were excavated across the waterway, one at the top (adjacent to the woods) and one at the bottom (adjacent to the wetland) to check for existing farm tile. The trenches were excavated approximately 30-40 feet long each and over 8-feet deep. No drainage tiles were discovered in this upper waterway.

The lower grassed waterway was constructed on the edge of the existing woods from the wetland on the north end; southward to the recently constructed wetland filter-retention area. The approximate constructed size of this waterway was 300 feet long and 20 feet wide. There was a known tile in this reach and it was excavated and removed or crushed on purpose. The tile was eliminated in this section to reduce drainage from the existing wetland and due to the fact that the outlet of this tile at Epworth Forest Road had been destroyed by the sanitary sewer work.



The area upstream of this tile was investigated by the design team and no tile inlets could be found. The adjacent detention basin on the church property was found to drain west, not east into the subject tile, as was originally presumed. Also, the remaining drainage above the tile section removed (that was not already wetland) sloped steeply upward, rising 20 feet in elevation within 500 feet of where the tile was removed. All of the potential drainage into this existing tile was on Bart Culver's property.

The grassed waterways were planted with a native grass seed mix. Species to be included in the seed mix are listed in the design plans (Appendix B). After seeding, the waterways were blanketed with a Curlex wood fiber mulch blanket and stapled in place following the manufacturer's recommendations. Once the vegetation matures, the native plantings will secure the soils with their root mass.

### **3.4 Wetland Filter – Retention Pond**

The retention basin was designed to hold a 10-year storm event (see calculations in Appendix C). An attempt was made to size the basin for a 100 year event; however, the model showed that a storm event of that magnitude would overtop Epworth Forest Road. The project designer met with the Town of North Webster officials on this issue. The original 12-inch tile drain, which was located 2.5 feet below the surface, was no longer functioning and it was learned during this meeting that it had been cut by the installation of the sanitary sewer and replaced with a surface culvert sometime in the 1990's. The existing 12-inch corrugated metal pipe (CMP) surface culvert (which was the only existing outlet for the entire 80-acre subwatershed) had been hooked back into the tile drain on the south side of Epworth Forest Road during the installation of the sanitary sewer. Additionally, it was discussed that the planned excavation would not create any additional storage because of the existing high water table (created by the destruction of the original tile drain). Epworth Forest Road, which sits 5.5 feet above the grade of the area where the retention was designed, became the "dam" for the retention. A meeting was held between the designer and the Town representative as well as the County Engineer, to document that the project was acceptable and that it had no influence on whether the road served as the "dam" in any size storm event. The existing 12-inch CMP was utilized as the outlet for the designed retention basin.

The retention basin was excavated to contain permanent water as part of the agreement with the landowner. The basin was excavated from an existing elevation of 875.9 (center) to 870 msl. The permanent pool elevation was set at 874.0 msl, the same level as the invert on the existing 12-inch CMP under Epworth Forest Road. The resulting permanent water was approximately 7,500 square feet. A new flange was placed on the rotted end of the CMP and the entrance to the pipe was rocked to prevent erosion and create a one-foot spillway for 24-hour detention of small storm events at 875 msl creating a temporary 15,000 square foot area of open water.

The retention area was seeded with emergent wetland mix in the shallow water zone (approximately 10-feet around the perimeter of the proposed open water) before the area filled with water. The remaining area around the wetland filter-retention area was then seeded with prairie grasses. The entire seeded area was then blanketed with Curlex erosion control mats (wood fiber mulch) where the ground was sloped and strew mulched where the ground was level.



A 4-inch clay drain tile was intercepted during the excavation of the wetland filter-retention area. The drain was coming from the direction of the existing farm home to the east. The tile was daylighted on the slope, above the permanent pool elevation so that if it was functional, it would not be negatively impacted by the project.

### **3.5 Drainage Pipe Replacement**

The drainage tile repair and replacement was originally to be designed and installed by the Town of North Webster as the local match for the work on the Culver property. Dual wall 12-inch plastic tile as well as two catch basins and numerous fittings were purchased and stored at the North Webster treatment plant pending the installation. Eventually, the Town requested that JFNew install the pipe because of a shortage in manpower and numerous weather delays. Approximately 200 feet of the pipe was installed with a catch basin in the spring of 2006. During regrading of the surface, a portion of pipe was pushed out of place, backing up a foot of water in the catch basin. During the fall of 2006, the property owner requested that we remove the catch basin while there to install the remaining 100 feet of pipe and repair the first section. The project was substantially complete in November 2006; however, a crew returned to the site in late March 2007 for final grading and seeding.

## **4.0 CONSTRUCTION SCHEDULE**

Construction began on the wetland filter in the fall of 2005 after crops had been removed. The wetland filter was completed by November 2005. The grassed waterways were installed in conjunction with the wetland filter retention area and were also completed in November 2005. The tile replacement through the residential yards was scheduled several times during 2005 and 2006 but weather and schedules delayed the project multiple times. The project was substantially completed in November of 2006 and this document completed in March 2007.

## **5.0 MONITORING AND MAINTENANCE SCHEDULE**

Seasonal monitoring of the wetland filter-retention site is recommended. The individuals conducting the monitoring should note whether there is:

- Open water
- Vegetation growing throughout or just around the edge of the open water
- The 12-inch pipe outlet is open and free of debris
- Areas adjacent to filter are fully vegetated

There should be open water in the middle of the wetland filter-retention basin with vegetation growing around the perimeter. If there is not, it could be that additional drainage has taken place and the water table was lowered; which would mean that it is not serving the use for which it was constructed. The 12-inch pipe under Epworth Forest Road that drains the overflow from the Culver property should be free of debris; please remove the debris if it exists. All areas surrounding the filter should be vegetated, if not JFNew should be contacted for potential replacement seeding.



## **6.0 PROJECT SUMMARY**

The 80-acre subwatershed flowing into the north side of Webster Lake adjacent to Hoss Hill Road contributed copious amounts of sediment to Webster Lake during storm events. The purpose of the project was to significantly reduce this sediment loading. The sources of the sediment were a 30-acre crop field and adjacent residential use of a failing tile drained section of the waterway. One part of the solution implemented was to replace the tenant farmer of the 30-acre agricultural field with someone who would plant a hay crop on the highly erodible field. The second part was to install grassed waterways in the dominant path of water through the same agricultural field and terminate the grassed waterway at a wetland filter-retention area. The final part of the solution was to repair and replace 300 feet of 12 inch tile through the residential section of the waterway just before it emptied into Webster Lake.

Approximately 700 feet of grassed waterway was installed, and a 7,500 square foot permanent pool wetland filter was installed to capture the sediment from the agricultural field. Approximately 300 feet of plastic tile was installed to repair and replace the existing collapsed clay tile throughout 500 feet of residential yards just north of Webster Lake. The project took three years to design and implement.



**APPENDIX A**

**Landowner Agreement**

**WEBSTER LAKE - CULVER PROPERTY  
STORM WATER FILTRATION PROJECT**

**KOSCIUSKO COUNTY, INDIANA**

**AGREEMENT FOR THE PURPOSE OF  
ACCESS TO CONSTRUCT AND MAINTAIN A TEMPORARY  
SEDIMENT DISPOSAL BASIN**

WEBSTER LAKE SKI  
CENTER INC

This Agreement, made and entered into on this \_\_\_\_\_ day of December 2005, by and between Bart Culver (THE OWNER) and the Webster Lake Conservation Association (THE ASSOCIATION), a not-for-profit corporation organized under the laws of the State of Indiana.

WITNESSETH:

THE OWNER, in consideration of the rents and covenants herein contained, does hereby enter in this Agreement for the use and maintenance of real property located in Tippecanoe Township, Kosciusko County, Indiana in the E1/2, NE1/4 of Section 10, Township 33 North, Range 7 East and more particularly described on the attached plan sheet, attached as Exhibit A and does grant to THE ASSOCIATION access to said Property for construction and maintenance of a wetland filter and grassed waterways.

WHEREAS, THE ASSOCIATION is a not-for-profit Indiana Corporation which is dedicated to improving the water quality of Webster Lake, located in Kosciusko County, Indiana; and

WHEREAS, THE ASSOCIATION wishes to undertake activities, including, construction and maintenance on the Property as part of its Lake Enhancement project to improve the water quality of Webster Lake, located in Kosciusko County, Indiana; and

WHEREAS, THE OWNER is in agreement with THE ASSOCIATION's desire to improve the water quality of Webster Lake.

NOW, THEREFORE, THE OWNER, for themselves, their successors and assigns, and their administrators, in consideration of the covenants, undertakings and agreements hereinafter set forth, and in consideration of the sum of Ten Dollars (\$10.00) and other valuable consideration, the receipt of which is hereby acknowledged, hereby grants **reasonable** access to THE ASSOCIATION to Property described hereinabove under the following terms and conditions:

**AGREEMENT PART I - ACCESS**

1. REFERENCE. Agreement Part I shall refer to the access unto the Property as designated on the attachment marked Exhibit A.

2. TERM. The term shall commence on the day this agreement is signed by the parties hereto and shall continue for a term of five (5) years. It is further agreed that this agreement, or modification of this agreement, **may** be transferable to subsequent owners of the same parcel prior to the expiration of said agreement with or without modification. This agreement may be modified or renewed by either party upon mutual agreement and with Sixty Days (60) notice to the other party.



3. USE.

A. THE OWNER grants to THE ASSOCIATION, their agents and assigns, the right to do specific acts on the Property as set out herein and THE OWNER retains all rights to the Property, with consideration of those rights granted to the THE ASSOCIATION.

B. THE OWNER grants THE ASSOCIATION reasonable right of access for the purpose of construction, maintenance, and inspections of a wetland filter and grassed waterways as defined on the engineering drawings in Attachment A, for the term of this agreement and any subsequent agreements, modifications, or assigns.

AGREEMENT PART II - GENERAL PROVISIONS

1. MANAGEMENT.

A. THE OWNER agrees that THE ASSOCIATION and its agents shall be permitted to enter onto the Property with such machinery, materials and equipment and the personnel and workers to operate said machinery and equipment to carry out the intended use of the Property by THE ASSOCIATION, including, the construction, inspection of, maintenance and repair of the wetland filter and grassed waterways. It is agreed that all improvements shall stay with the land until this agreement expires or is modified.

B. THE OWNER agrees that THE ASSOCIATION shall have the right to take such tests and borings on the Property as THE ASSOCIATION deems necessary to carry out its intended use, and to take photographs of the Property, provided, THE OWNER is advised of such borings, tests, and photographs, and the necessity of such.

C. THE OWNER limits the rights granted to THE ASSOCIATION as contained herein, and that THE ASSOCIATION may enter onto the Property for the intended use as described, and not for the recreational use by THE ASSOCIATION and/or its agents, or the general public.

D. Rights to the Property shall be retained by THE OWNER. Further, THE OWNER agrees that those activities agreed between the parties will not be interfered with, provided, that THE ASSOCIATION has not deviated from said agreement of intended use without first securing the permission or agreement from THE OWNER.

E. THE ASSOCIATION shall give notice to THE OWNER of its intention to enter onto the Property for purpose of inspection, maintenance and repair of the wetland filter and grassed waterways. THE ASSOCIATION shall not enter Property without permission from THE OWNER, which permission will not be unreasonably withheld.

F. Upon completion of the project, THE ASSOCIATION will retain maintenance rights to the reconstructed area for the period of the agreement, although THE OWNER may manage and control plant and animal life on the Property.

2. TAXES. Shall be borne by THE OWNER, or their successors and/or assigns of the said real estate, and any assessments, shall also be born by the same.

3. CONDEMNATION. THE OWNER agrees that if the Property, or any part thereof, shall be taken

or condemned for public or quasi-public use or purpose by any competent authority, THE ASSOCIATION shall have the right to defend against such attempted condemnation of the Property or any part thereof. If, in the opinion of THE ASSOCIATION, the Property becomes unmanageable or unsuitable for its Intended Use and Purpose as a result of such condemnation, this Agreement may be terminated by THE ASSOCIATION upon sixty (60) days written notice to THE OWNER.

4. LIABILITY/INSURANCE.

A. Nothing in this Agreement shall be construed as imposing any additional liability on THE OWNER. Any and all contractors performing the work for THE ASSOCIATION on this project shall name THE OWNER as additional insured on their liability policies. Prior to the start of construction and throughout the term of the Agreement thereafter, the contractors performing the work described in this agreement shall carry a policy of one-million (1) dollars liability insurance and required workman's compensation insurance covering all of its activities on the Property. At the request of THE OWNER, THE ASSOCIATION shall provide THE OWNER with a certificate or other evidence that such insurance is in effect by each contractor.

B. THE ASSOCIATION's contractors shall be responsible for and shall indemnify and hold THE OWNER harmless from any and all costs, including the expense of defending any claim of legal action related to any injury or damage to the project area, caused by or resulting from THE ASSOCIATION's activities on the Property.

5. DAMAGES.

A. THE ASSOCIATION shall restore all road surfaces owned by THE OWNER to their original condition if said surfaces are damaged by equipment and/or machinery used by THE ASSOCIATION and its agents during ingress and egress from the Property.

B. Before final completion of the work on said premises, THE ASSOCIATION and its agents shall adequately clean up, replace fences and guard rails and replant the construction site to the original condition or the satisfaction of THE OWNER whichever is less.

C. This commitment pertains to construction, repair and maintenance completed by THE ASSOCIATION and its agents on the Property.

6. EXPENSE. THE ASSOCIATION shall be responsible for all expenses incurred in the construction, repair, use, inspection and maintenance of the Intended Use of the Property by THE ASSOCIATION as set out in Part I of this Agreement.

7. NO LIEN AGREEMENT. In consideration of the rents and covenants herein contained, THE ASSOCIATION, for itself and for all contractors, subcontractors, laborers, or persons performing labor upon or furnishing materials or machinery for the Intended Use of the Property as set out herein, agrees that:

A. No lien shall attach to the Property or to THE OWNER's property, or to any structure or other improvement to be constructed on the Property; and

B. Any recording of this Agreement is intended solely for the purpose of giving proper notice as provided under IC 32-8-3-1 et seq.; and no lien whatsoever is created against the real estate as the result of the execution or recordation of this Agreement.

8. TRESPASS. THE OWNER grants to THE ASSOCIATION and its contractor(s) permission to

enter onto the Property during normal working hours (7am to 7pm), *with proper notice*, to carry out its Intended Use as set out herein. All others shall be considered trespassers on the Property unless the party has permission of THE OWNER to be on the Property.

9. DEFAULT.

A. Breach of any covenant herein shall constitute a default under this Agreement. In the event of a default, the defaulting party shall be entitled to thirty (30) days written notice specifying the nature of the default and giving the defaulting party an opportunity to cure the default. If the default is not corrected within thirty (30) days after written notice is received, the injured party may elect to terminate this Agreement.

B. If the use intended for the Property is not approved by any governmental agency having jurisdiction over the reconstruction project, THE ASSOCIATION and THE OWNER shall each have the right to terminate the Agreement by giving written notice to the other party. Within sixty (60) days from the date the notice is received by THE OWNER, the Agreement shall be null and void.

10. NOTICE. Any notice required by this Agreement shall be served upon the other party by mail at the address set forth below or at such other address as the parties may hereinafter designate:

Bart Culver	President – Webster Lake Conservation Association
P.O. Box 294	606 North Eckert Drive
North Webster, IN 46555	North Webster, Indiana 46555

11. AGENTS. Where in this instrument rights are given to the Webster Lake Conservation Association, THE ASSOCIATION or THE OWNER, such rights shall also extend to the agents, officers or employees of the parties.

12. BINDING EFFECT. This Agreement shall become effective at the time construction on the Property begins and shall be binding upon THE OWNER, their heirs, personal representatives, successors and assigns and upon THE ASSOCIATION and any successor organizations.

13. TITLE. THE OWNER hereby represent and warrant that they are owners of the Property covered by this Agreement and that they have the right to enter into this Agreement and to bind themselves and their heirs, successors, assigns, and personal representatives.

14. This Agreement shall be interpreted under the laws of the State of Indiana.

15. Headings are for reference only and do not affect the provisions of this Agreement.

16. Where appropriate, the singular shall include the plural.

17. This Agreement contains all of the agreements of the parties, all prior negotiations, understandings and agreements having been merged into it. Amendments of this Agreement shall not be effective unless made in writing and signed by the parties.


18. In the event THE ASSOCIATION should cease to exist, the Agreement shall be binding upon the organization that succeeds the said association, provided that the succeeding organizations' membership consists of property owners of real estate on Webster Lake, Kosciusko County, Indiana.

19. Any person signing this Agreement in a representative capacity for a party affirms under the penalties for perjury that he or she has the actual authority to so sign.



IN WITNESS WHEREOF, Bart Culver, THE OWNER, and Dawn Meyer, current President, of THE ASSOCIATION, have caused this Agreement to be executed on the day and year above first written with the following signatures.

BY:



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Bart Culver - THE OWNER

*BARTS WATER SKI CENTER INC*

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Dawn Meyer - Lake Webster Conservation Association

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Witness (include name and address)

**APPENDIX B**

**DESIGN PLANS**

**WEBSTER LAKE - CULVER PROPERTY  
STORM WATER FILTRATION PROJECT**

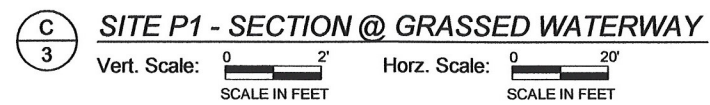
**KOSCIUSKO COUNTY, INDIANA**











Vert. Scale:

0 2  
SCALE IN FEET

Horz. Scale

0 20  
SCALE IN FEET

LOCATION: S/U Indianapolis Drawings CAD Project Library 960425 - Website: Lake2005-1103-SECTIONS.dwg  
LAYOUT: 03-PROPOSED SITE  
DATE/TIME: October 31, 2005 - 3:15pm  
PLOTTED BY: Jhuizer

**Indianapolis Office**  
6640 Parkdale Place, Suite S  
Indianapolis, Indiana 46254  
317-388-1982

REVISION

WEBSTER LAKE  
DNR - Detention/Sediment Basin  
Sites P1 and P2 Cross Sections

DRAWN BY: JFH

DESIGNED BY: JR

DATE: NOV 2005

**JOB NO:** 980425

**DRAWING NO.**

3

**OF 3**



**Emergent Wetland Seed Mix**

Revised: 12/14/05-Bob

*Seed mix A*

<b>Requested Acres:</b>	<b>0.5</b>
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<b>Botanical Name</b>	<b>Common Name</b>	<b>PLS Ounces/Acre</b>	<b>Required Ounces</b>
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**Permanent Grasses/Sedges/Rushes:**

1	<i>Carex comosa</i>	Bristly Sedge	2.00	1.00
2	<i>Carex lacustris</i>	Common lake sedge	1.50	0.75
3	<i>Carex lurida</i>	Bottlebrush Sedge	4.00	2.00
4	<i>Eleocharis obtusa</i>	Spike Rush	3.00	1.50
5	<i>Juncus effusus</i>	Common Rush	4.00	2.00
6	<i>Leersia orzyoides</i>	Rice Cut Grass	3.00	1.50
7	<i>Scirpus acutus</i>	Hard-stemmed bulrush	6.00	3.00
8	<i>Scirpus pungens</i>	Chairmakers rush	6.00	3.00
9	<i>Scirpus validus</i>	Great bulrush (Softstem)	8.00	4.00

**37.50**

**Temporary Cover:**

1	<i>Avena sativa</i>	Seed oats	360.00	180.00
2	<i>Lolium multiflorum</i>	Annual rye	104.00	52.00

**464.00**

**Forbs:**

1	<i>Acorus calamus</i>	Sweet Flag	3.00	1.50
2	<i>Asclepias incarnata</i>	Swamp Milkweed	2.00	1.00
3	<i>Alisma</i> spp.	Water Plantain	4.00	2.00
4	<i>Eupatorium maculatum</i>	Spotted Joe Pye Weed	0.75	0.38
5	<i>Hibiscus</i> spp.	Rosemallow, various	3.00	1.50
6	<i>Iris virginica shrevei</i>	Blue Flag Iris	4.00	2.00
7	<i>Lobelia cardinalis</i>	Cardinal flower	0.75	0.38
8	<i>Lobelia siphilitica</i>	Great blue lobelia	0.75	0.38
9	<i>Ludwigia alternifolia</i>	Seedbox	0.25	0.13
10	<i>Mimulus ringens</i>	Monkey Flower	1.00	0.50
11	<i>Peltandra virginica</i>	Arrow Arum	12.00	6.00
12	<i>Pontederia cordata</i>	Pickereel Weed	8.00	4.00
13	<i>Sagittaria latifolia</i>	Broad-Leaf Arrowhead	8.00	4.00
14	<i>Sparganium americanum</i>	American Burr Reed	2.00	1.00
15	<i>Sparganium eurycarpum</i>	Bur Reed	4.00	2.00
16	<i>Verbena hastata</i>	Blue Vervain	2.00	1.00
17	<i>Zizania aquatica</i>	Wild rice	10.00	5.00

**65.50**

**Total Ounces**

**283.50**



**Swale Seed Mix**

Revised: 12/14/05-Bob

*Seed mix B*

<b>Requested Acres:</b>	<b>0.25</b>
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<b>Botanical Name</b>	<b>Common Name</b>	<b>PLS Ounces/Acre</b>	<b>Required Ounces</b>
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**Permanent Grasses/Sedges**

1	<i>Andropogon gerardii</i>	Big Blue Stem	6.00	<b>1.50</b>
2	<i>Carex comosa</i>	Bristly Sedge	2.00	<b>0.50</b>
3	<i>Carex hystericinia</i>	Porcupine Sedge	2.50	<b>0.63</b>
4	<i>Carex vulpinoidea</i>	Brown Fox Sedge	3.00	<b>0.75</b>
5	<i>Elymus virginicus</i>	Virginia wild rye	14.00	<b>3.50</b>
6	<i>Glyceria striata</i>	Fowl Manna Grass	1.00	<b>0.25</b>
7	<i>Panicum virgatum</i>	Prairie Switch Grass	2.00	<b>0.50</b>
8	<i>Scirpus atrovirens</i>	Dark Green Rush	2.00	<b>0.50</b>
9	<i>Scirpus cyperinus</i>	Woolgrass	0.50	<b>0.13</b>
10	<i>Spartina pectinata</i>	Prairie Cord Grass	5.00	<b>1.25</b>

**38.00**

**Temporary Cover:**

1	<i>Avena sativa</i>	Seed oats	360.00	<b>90.00</b>
2	<i>Lolium multiflorum</i>	Annual Rye	28.00	<b>7.00</b>

**388.00**

**Forbs:**

1	<i>Alisma spp.</i>	Water Plantain	0.50	<b>0.13</b>
2	<i>Asclepias incarnata</i>	Swamp Milkweed	2.00	<b>0.50</b>
3	<i>Aster novae-angliae</i>	New England Aster	0.50	<b>0.13</b>
4	<i>Coreopsis tripteris</i>	Tall Coreopsis	0.50	<b>0.13</b>
5	<i>Eupatorium maculatum</i>	Spotted Joe Pye Weed	0.25	<b>0.06</b>
6	<i>Iris virginica shrevei</i>	Blue Flag Iris	3.00	<b>0.75</b>
7	<i>Liatris spicata</i>	Marsh Blazing Star	2.00	<b>0.50</b>
8	<i>Lobelia cardinalis</i>	Cardinal Flower	0.25	<b>0.06</b>
9	<i>Lobelia siphilitica</i>	Great Blue Lobelia	0.50	<b>0.13</b>
10	<i>Sagittaria latifolia</i>	Broad-Leaf Arrowhead	1.50	<b>0.38</b>
11	<i>Silphium perfoliatum</i>	Cup Plant	0.50	<b>0.13</b>
12	<i>Verbena hastata</i>	Blue Vervain	1.50	<b>0.38</b>
13	<i>Zizia aurea</i>	Golden Alexanders	1.25	<b>0.31</b>

**14.25**

**Total Ounces      110.06**

**Economy Prairie Seed Mix**

*seed mix C*

<b>Requested Acres:</b>	<b>1</b>
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<b>Botanical Name</b>	<b>Common Name</b>	<b>PLS Ounces/Acre</b>	<b>Required Ounces</b>
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**Permanent Grasses:**

1	<i>Andropogon gerardii</i>	Big Blue Stem	11.00	<b>11.00</b>
2	<i>Andropogon scoparius</i>	Little Blue Stem	24.00	<b>24.00</b>
3	<i>Bouteloua curtipendula</i>	Side Oats Grama	18.00	<b>18.00</b>
4	<i>Carex bicknelli/molesta/brevior</i>	Prairie Sedge Mix	1.00	<b>1.00</b>
5	<i>Elymus canadensis</i>	Prairie Wild Rye	16.00	<b>16.00</b>
6	<i>Panicum virgatum</i>	Prairie Switch Grass	1.50	<b>1.50</b>
7	<i>Sorghastrum nutans</i>	Indian Grass	10.00	<b>10.00</b>
			<b>81.50</b>	

**Temporary Cover:**

1	<i>Avena sativa</i>	Seed Oats	360.00	<b>360.00</b>
2	<i>Lolium multiflorum</i>	Annual Rye	120.00	<b>120.00</b>
			<b>480.00</b>	

**Forbs:**

1	<i>Asclepias tuberosa</i>	Butterfly weed	1.25	<b>1.25</b>
2	<i>Aster novae-angliae</i>	New England Aster	0.75	<b>0.75</b>
3	<i>Cassia fasciculata</i>	Partridge Pea	3.50	<b>3.50</b>
4	<i>Coreopsis lanceolata</i>	Sand coreopsis	3.00	<b>3.00</b>
5	<i>Echinacea purpurea</i>	Purple coneflower	3.00	<b>3.00</b>
6	<i>Heliopsis helianthoides</i>	False Sunflower	0.25	<b>0.25</b>
7	<i>Liatris aspera</i>	Rough Blazing Star	1.50	<b>1.50</b>
8	<i>Lupinus perennis</i>	Wild Lupine	0.50	<b>0.50</b>
9	<i>Ratibida pinnata</i>	Yellow Coneflower	2.50	<b>2.50</b>
10	<i>Rudbeckia hirta</i>	Black-Eyed Susan	4.00	<b>4.00</b>
			<b>20.25</b>	

Annual/Perennial Forbs Mix		<b>24.00</b>	<b>24.00</b>
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**Total Ounces      594.75**

**APPENDIX C**

**DESIGN CALCULATIONS**

**WEBSTER LAKE - CULVER PROPERTY  
STORM WATER FILTRATION PROJECT**

**KOSCIUSKO COUNTY, INDIANA**

JOB Bart Culver

SHEET NO. \_\_\_\_\_

OF \_\_\_\_\_

CALCULATED BY \_\_\_\_\_

DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_

DATE \_\_\_\_\_

SCALE \_\_\_\_\_

- Option #1 -
1. Existing basin w/road as natural dike  
Extend dike 15 additional ft. to get pooled area away from road
  2. Fill easement area to elevation 818.5
  3. Excavate 3400 cu yds from basin area for additional storage. 1200 cu yds for fill at road and 2200 cu yds spread into crop field.
  - \* 4. Construction of DNR Project \$3000
  5. Construct Grass Waterway

Cost

\$14,029 (including \$2000 for top soil stripping)

- Option #2 -
1. Existing basin w/road as natural dike  
Same as #1 Above
  2. Same
  3. Excavate only the 1200 cu yds from basin needed for fill.
  - \* 4. Construction of DNR Project \$3000
  5. Grass waterway  
Cost \$7500

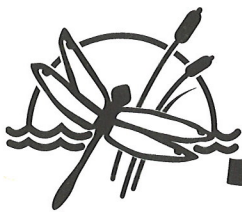
NOTE: Protection between 5yr - 10yr storm.  
Loss effectiveness for settling soil

- Option #3 -
1. Existing basin
  - \* 2. DNR Project \$3000
  3. 5yr storm - Less effective for sedimentation

- Option #4
1. Move dike upstream - less length
  2. No need for disposal area
  3. Engineer's Stamp
  4. \$11,000 - 12,000
  5. Smaller DNR Dike \$1500 - 2000 - May not be needed

Need Approvals - Engineers  
- Local homeowners and agencies





# JFN New

JOB \_\_\_\_\_  
 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_  
 CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 SCALE \_\_\_\_\_

## Webster Lake Project "Bart Culver Property"

Objective: Reduce the delivery of sediment and attached nutrients into Webster Lake.

Hydrology: W/S 85 acres  
 10yr. Storm Event 3.9" Rain fall in 24 hours  
 Natural Storage in sub-watershed A1B

Acres Feet of runoff = 8.5

Alternatives: (Listed in order of having the most beneficial impact)

1. Convert cropland to a permanent land use, such as woodland and/or wildlife habitat. 10yr Storm = 0.76" Runoff  
 Install grass waterway to control ephemeral gully erosion  
 Construct filter strip along woody edge to road culvert

2. Convert cropland to long-term hay, install grass waterway, construct filter strip along woody edge and construct sediment basin to meet the 10yr Storm - Requires excavating approx 1775 cu yds  
 10yr Storm = 0.92" Runoff

3. Convert cropland to long-term hay, install grass waterway and install filter strip along woody edge  
 10yr Storm = 0.92" Runoff

4. Construct sediment basin (dry basin) to meet the 10yr Storm - Maintain existing cropland  
 W/W, grass, filter strip  
 10yr Storm = 1.47" Runoff

All alternatives require construction of the sediment basin design to control the 10yr storm. 13000

a) Excavate 3400 cu yds of soil from natural basin to increase desired storage volume. Utilize 1200-1500 cu yds to fill along road and easement entrance. The remaining 1900-2200 cu yds would be spread into the crop field.

4.52 Ac/Ft Existing Basin  
 1.99 " " DNR Project  
 2.18 Excavated Area  
 8.69 Ac/Ft Total Provided

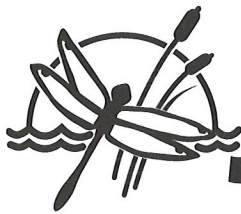
a190 Hay 4800  
 w/w 1800  
 Basin 4450  
 Filter 800

13000

18140

15000  
 2000 Strip





Kent Truog - step by

# JFNew

JOB Change due to lowering  
SHEET NO. storage 0.6' OF \_\_\_\_\_  
CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
SCALE \_\_\_\_\_

10yr- 24 hour Storm Event (Recommended for Sediment Control) 3.9" Rain in 24 Hours

Requires 8.5 ac/ft Storage of runoff

Provided: 4.52 Existing Basin w/road as dike  
\* 1.99 With DNR Project  
2.18 With excavation of 3400 cu.yds from basin area  
\_\_\_\_\_ (Will require large disposal area - 1 1/4 acre 12" Fill)  
8.69 Ac.Ft

Cost \$12229 + \$1800 Waterway = \$14029  
(Includes top soil stripping in disposal area)

## Options

1. Provided 4.52 Existing Basin w/road as dike  
.74 Excavation in the basin to widen dike  
\* 1.99 DNR Project  
7.25 Ac/Ft

Protection some where between a 5yr (3.4") and 10 yr (3.9") storm event.

Cost \$5211 + \$1800 Waterway = \$7011

NOTE: May want to run this option pass Kent Tracey

2. Provided 4.52 Ac/Ft Existing Basin w/road as dike  
\* 1.99 Ac/Ft DNR Project  
6.51 Ac/Ft = 5yr (3.4") storm event

Why is 10yr storm recommended = Run off 5yr = 1.13"  
10yr = 1.47"

Cost of DNR Project is \$3000.00

\* Not a good site to store a 10yr storm  
DNR project required

\* More of a flood control project



## Assistance Notes

### Webster Lake - Bart Culver Property

Meeting w/ John Richardson — Total Design Cost \$24,000

Detention Structure - Minimum 5yr-24HR

Sediment Retention - Need 10yr-24HR w/ county road and homes downstream.

Budget \$14,000 for Construction less \$3000.00 drain south of Epworth  
Use \$9,000 for earth moving  
Retention Area along woods line, if necessary.

Land Use (CN) figured on cropland -- not sure Culver property will be going to hay - long term.

Need to leave minimum 75' access west of home for future entrance.

Grassed Waterway

Permanent water if possible

Denny 834-7241 - City Utilities - Backhoe  
Chet

### Soils Investigation —

Met w/ Chet (City Utilities) - Could not dig test hole at time we scheduled. Chet dug and logged hole later that day and I stopped and looked at 4 Days later. Water within 1' of surface. 0-2' Silt loam - Washed in top soil.

2-3' Clay loam

3-5' Sandy loam to sandy clay loam

5-8' Clay loam

NOTE: ① Retention at ground level - w/ditch

② Because of sandy layer the idea of permanent water will fluctuate.

③ Was informed runoff tops road occasionally. Project will not eliminate this.

③ Retention pool could affect church and need approval from Randy Hiny